

Massive Subcutaneous Emphysema and Pneumothorax in a Case of Attacked by a Domesticated Bull – An Autopsy Based Diagnosis

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INTRODUCTION

Subcutaneous emphysema describes the presence of gas in subcutaneous tissue, as the name suggests.¹ It has several known causes, few of them being anaerobic infections, traumatic disruption of mucosal surface and alveolar rupture.¹ Diagnosis of subcutaneous emphysema is characterized by the presence of crepitation on palpation (Rice Krispies) over the affected area and radiographic evidence of gas in the subcutaneous tissue.^{1,2} The pathogenesis relates to the tracking of gas along fascial planes into the subcutaneous space of the neck, chest or extremities.¹ Subcutaneous emphysema along with pneumomediastinum is called Hamman's syndrome, it is also known as Macklin's syndrome coined after Macklin et al. in the year 1944, who were credited for the description of pathophysiology of subcutaneous emphysema in detail.³ Treatment of subcutaneous emphysema is generally

ABSTRACT

Subcutaneous emphysema is a condition when air or gas gets trapped within the subcutaneous layer. It is characterised by crackling feeling on palpation of the skin known as subcutaneous crepitation which is described as touching rice krispies. A 70 years male from hilly region of Nepal with agricultural background suffered multiple injuries sustained due to an attack by domesticated bull in his house. Upon the incident the injured male was taken to hospital, where he was declared "Brought Dead" by the Emergency Department of Dhulikhel Hospital, Kathmandu University Hospital. His body was brought for autopsy in Department of Forensic Medicine and Toxicology of Kathmandu University School of Medical Sciences. On complete autopsy, massive subcutaneous emphysema and pneumothorax was demonstrated. The details of finding are discussed in detail as follows.

KEY WORDS

Autopsy, Pneumothorax, Subcutaneous emphysema

supportive as being self-limiting and benign and involves treatment of underlying condition, which warrants a search for serious underlying condition e.g. pneumothorax, pneumomediastinum, and tracheobronchial or esophageal disruption.¹ Postmortem artefact have finding similar to subcutaneous emphysema may be evident due advanced stage decomposition.

CASE REPORT

A 70 years male from hilly region of Nepal with agricultural background suffered multiple injuries sustained due to an attack by domesticated bull in his house. Upon the incident the injured male was taken to hospital, where he was declared "Brought Dead" by the Emergency Department

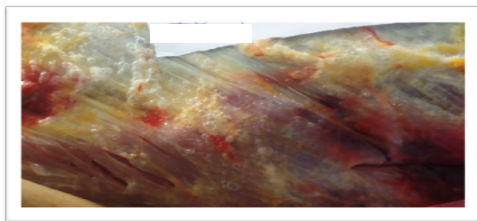


Figure 1. Air bubbles in the subcutaneous tissue of the thoracic region.



Figure 2. Contusion present on the anterior aspect of thorax.



Figure 3. Laceration present on the anterior aspect of thorax on left side.

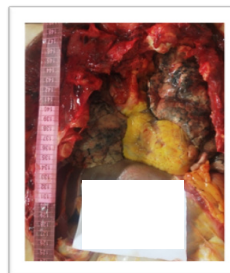


Figure 4. Pneumothorax and collapsed bilateral lungs.



Figure 5. Fracture of bilateral ribs with contusion on the posterior aspect of thorax.



Figure 6. Contusion present on the under surface of the sternum, anterior to heart.



Figure 7. Bilateral lungs on gross examination

of Kathmandu University School of Medical Sciences, Dhulikhel Hospital. Police inquest was initiated and his body was brought for autopsy in Department of Forensic Medicine and Toxicology of Kathmandu University School of Medical Sciences, Dhulikhel Hospital.

The body of an elderly male moderately built and nourished with wheatish complexion was brought for autopsy. The body was cold to touch (preserved in cold chamber) and stiff at all the joint, post-mortem lividity was present on the back and was fixed. The examinee had sustained multiple injuries on the body predominantly on the extremities; however crepitations were felt on bilateral upper quadrant of abdomen, left upper chest, left lower back and left infra-scapular region. Post incision on the body and reflection of skin, air bubbles were seen in subcutaneous layer which did not rupture on pressure of chest, abdomen, bilateral flanks, thoracic region (Fig. 1) showed contusion involving bilateral Pectoralis major muscles (Fig. 2), however on left side at mid-clavicular line, the inter-coastal muscles of 3rd to 5th rib was lacerated with intact skin (Fig. 3). Contusion was also present at left iliac fossa. Right sided Pneumothorax was demonstrated when water was poured inbetween the skin flap and lateral thoracic wall and the intercostal muscles were punctured with the scalpel under water, observing air bubbles, thus demonstrating Pneumothorax. Bilateral lungs were collapsed (Fig. 4) with 100 ml of blood on right and 50 ml on left pleural cavities and 2nd to 10th ribs were fractured bilaterally (Fig. 5). Under surface of sternum also showed contusion (Fig. 6). The organs such as liver, spleen and bilateral kidneys were pale on cut section. Crepitations

were felt on the bilateral lungs surface, on cut section the lungs were pale (Fig. 7).

DISCUSSION

In 1617, midwife to the queen of France Louise Bourgeois, first described subcutaneous emphysema, which was later characterized by Laennec in the year 1819.^{4,5} Subcutaneous emphysema is seen commonly following injury, surgery, mechanical ventilation and infection, but there have been case reports where it presented spontaneously.⁶ Subcutaneous emphysema has rarely been described in the absence of trachea-bronchial injury following trauma, which include respiratory failure attributed to chest wall injury, contusion or laceration of lungs and airway, bring on Pneumothorax resulting in hypoxemia, leading to life threatening possibilities.⁴

Multiple protocols exist for the management of subcutaneous emphysema, which primarily aims conservative management with quality supportive care, however treating the underlying cause of subcutaneous emphysema.⁷⁻¹¹ In life threatening condition or when vital structures of neck and thorax are compressed, pleural drains and infraclavicular “grill” has been helpful as reported by Herlan et al. and Kiefer et al.^{12,13} A more aggressive management has been reported Sherif et al., O’Reilly et al. and Martinez et al., which illustrates drainage of subcutaneous emphysema under negative pressure.¹⁴⁻¹⁶

The case we are reporting is at autopsy. In the autopsy when we encounter subcutaneous emphysema, the paramount importance is to trace the origin. Have various causes, in our case trauma to the thoracic region with fracture of ribs and laceration of the intercostals muscles on the left side should have been the cause of for the air to enter the subcutaneous. However the origin of pneumothorax and air in the plural cavity could not be traced but explains the pathway. Further adding to the confusion was collapsed lungs. Nevertheless multiple fractures of ribs leading to

laceration of lungs, with blood in the bilateral plural cavity and the history of trauma was in favor to subcutaneous emphysema of traumatic origin.

Subcutaneous emphysema though being a rare entity, when observed is self limiting and if treatment required, supportive management with treating the underlying cause is of importance. On autopsy tracing the origin of subcutaneous emphysema, which commonly is traumatic in nature leading to injury to air-way, oesophagus, and lungs, evident in this case.

REFERENCES

- Hyzy Rc, Mccllelland Mr. Trauma, Chest Subcutaneous Emphysema. In: Encyclopedia of Respiratory Medicine [Internet]. Elsevier; 2006 [Cited 2023 Mar 20]. P. 298–302. Available From: <https://linkinghub.elsevier.com/retrieve/pii/B012370879600401>
- Alan T Lefor. Critical care on call. New York: Lange Medical Books/Mc Grew Hill, Medical Publishing Division. 2002.
- Macklin MT, Macklin CC. Malignant interstitial emphysema of the lungs and the mediastinum as an important occult complication in many respiratory diseases and other conditions: An interpretation of clinical literature in light of laboratory experiment. *Medicine*. 1944; 23(4): 281-358.
- Olmstead D, Gelfand G, Anderson I, Kortbeek JB. A Case Report of Acute Airway Compromise due to Subcutaneous Emphysema. *Case Rep Med*. 2018 Nov 25;2018:3103061.
- Munsell WP. Pneumomediastinum: A Report of 28 Cases and Review of the Literature. *JAMA*. 1967 Nov 20;202(8):689.
- Talwar A, Esquire A, Sahni S, Verma S, Grullon J, Patel P. Spontaneous pneumomediastinum: Time for consensus. *North Am J Med Sci*. 2013;5(8):460.
- Grapatsas K, Tsiologianni Z, Leivaditis V, Kotoulas S, Kotoulas C, Koletsis E, et al. Hamman's syndrome (spontaneous pneumomediastinum presenting as subcutaneous emphysema): A rare case of the emergency department and review of the literature. *Respir Med Case Rep*. 2017 Dec 11;23:63-65. doi: 10.1016/j.rmcr.2017.12.004. PMID: 29276676; PMCID: PMC5730040.
- Sogut O, Cevik M, Boleken ME, Kaya H, Dokuzoglu MA. Pneumomediastinum and subcutaneous emphysema due to blunt neck injury: a case report and review of the literature. *J Pak Med Assoc*. 2011 Jul;61(7):702–4.
- Devaraj U, Ramachandran P, D'souza GA. Recurrent spontaneous pneumomediastinum in a young female: Hamman's crunch revisited(†). *Oxf Med Case Reports*. 2014 May 1;2014(2):18-20. doi: 10.1093/omcr/omu008. PMID: 25988012; PMCID: PMC4369980.
- Whelan S, Kelly M. Pneumomediastinum following a prolonged second stage of labor – an emphasis on early diagnosis and conservative management: a case report. *J Med Case Reports*. 2017 Dec;11(1):313.
- Schneider T, Storz K, Dienemann H, Hoffmann H. Management of iatrogenic tracheobronchial injuries: a retrospective analysis of 29 cases. *Ann Thorac Surg*. 2007 Jun;83(6):1960-4. doi: 10.1016/j.athoracsur.2007.01.042. PMID: 17532378.
- Herlan DB, Landreneau RJ, Ferson PF. Massive Spontaneous Subcutaneous Emphysema. *Chest*. 1992 Aug;102(2):503–5.
- Kiefer MV, Feeney CM. Management of subcutaneous emphysema with “gills”: case report and review of the literature. *J Emerg Med*. 2013 Nov;45(5):666-9. doi: 10.1016/j.jemermed.2013.04.052. Epub 2013 Aug 30. PMID: 23993942.
- Sherif HM, Ott DA. The use of subcutaneous drains to manage subcutaneous emphysema. *Tex Heart Inst J*. 1999;26(2):129–31.
- O'Reilly P, Chen HK, Wiseman R. Management of extensive subcutaneous emphysema with a subcutaneous drain. *Respirol Case Rep*. 2013 Dec;1(2):28-30. doi: 10.1002/rcr2.9. Epub 2013 Sep 8. PMID: 25473535; PMCID: PMC4184520.
- Santalla Martínez M, Dacal Quintas R, Velázquez PM. Treatment with subcutaneous drainage in the pneumomediastinum and massive subcutaneous emphysema. *Arch Bronconeumol*. 2013 Mar;49(3):127-8. English, Spanish. doi: 10.1016/j.arbres.2012.09.001. Epub 2012 Nov 9. PMID: 23142607.